REMARKS

This amendment is responsive to the Office action mailed April 7, 2004 for the above-captioned application.

- Claims 1-5, and 8-12 have been rejected under 35 USC 103(a).
- Claims 6-7 and 13-14 have been objected to as being dependent upon a rejected base claim, but allowable if rewritten in independent format
- Claims 1 and 8 have been amended.
- Claims 15-27 have been added.
- Claims 1-27 are pending.
- Claims 1, 8, 15, 19, 22, 25, 26 and 27 are in independent format.

Claim Objections

Claims 6-7 and 13-14 have been objected to as being dependent upon a rejected base claim, but indicated as being allowable if rewritten in independent format including all the limitations of the base claim and any intervening claims.

- New claim 19 corresponds to original claim 6 as rewritten in independent format, including all the limitations of the base claim and any intervening claims.
- New claim 22 corresponds to original claim 7 as rewritten in independent format, including all the limitations of the base claim and any intervening claims.
- New claim 26 corresponds to original claim 13 as rewritten in independent format, including all the limitations of the base claim and any intervening claims.
- New claim 27 corresponds to original claim 14 as rewritten in independent format, including all the limitations of the base claim and any intervening claims.

Claim Rejections, the Cited Art and the Inventions Distinguished

Claims 1-5 and 8-12 have been rejected under 35 USC 103(a) as being unpatentable over Kreitman et al. (U.S. Patent No. 5,491,517) in view of Gardos et al (U.s. Patent No. 5,710,602). Kreitman discloses a system for implanting an image into a video stream. In an exemplary embodiment an application is described for implanting an advertisement onto a wall panel behind home plate on the telecast of a baseball game. A model of the stadium is given prior to implantation, (col. 6, lines 7-16). It is noted that there is no disclosure or suggestion of the model being derived from a stream of

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images. The stadium model is subjected to various transform matrices to achieve a plurality of transformed models, (col. 3, lines 13-22). A transformed model is then selected for a given image frame to properly locate an implantation image within the image frame, (col. 3, lines 23-26 and abstract, lines 9-18). It is noted that the original model and all transformed models are derived without regard to the video frames being processed.

Gardos et al. describe gain correction for encoding video images. Gardos describe a system in which foreground images are encoded for each frame, while background images are encoded for less frames and reused for other frames. Gardos et al. observe that when automatic gain control is implemented on a camera, the background portion of a sequence of frames may appear to change as examined mathematically, while in fact, the background has not changed. As a result, extra video encoding is performed, because the apparently changed background portions are getting encoded at the various gain adjustments. Gardos et al. propose correcting for gain when identifying foreground versus background regions of a current image, (col. 6, line 64-66).

Gardos et al. describe a reference frame, which is used to identify changed pixels from one frame to another, (col. 7, lines 30-37). Reference pixels are derived by averaging the corresponding pixels from the previous n frames, (col. 5, lines 14-16).

Independent claim 1 is directed to a method of tracking an object among a plurality of image frames. Claim 1 distinguishes over the cited art based at least upon the following claim limitations:

- deriving a background model from the plurality of image frames, wherein for each image frame, background pixels within an observable portion of the background are identified, and <u>wherein an identified background pixel is included in the background model only after being observable within the background for at least three consecutive image frames.</u>

Kreitman et al. do not derive a background model from a plurality of image frames. Gardos et al.'s reference frame does not include criteria for determining whether a

pixel is part of the reference frame. It appears that all Gardos et al.'s pixels are part of the reference frame. Applicants' claim 1, however, recites that a background pixel is included in the background model only after being observed in the background for at least 3 consecutive image frames.

Claims 2-7 ultimately depend from claim 1, and distinguish over the cited art for the same reasons as given for claim 1. Claims 6 and 7 further distinguish over the cited art as indicated by the examiner. Claim 4 further distinguishes over the cited art based on the step of predicting a background value based in part on a mixing factor. This distinction is discussed in more detail below with regard to new claim 15.

Independent claim 8 is directed to an apparatus for tracking an object among a plurality of image frames. Claim 8 distinguishes over the cited art based at least upon the following claim limitations:

- a background model derived from the plurality of image frames, wherein for each image frame, background pixels within an observable portion of the background are identified, and <u>wherein an identified background pixel is included in the background model only after being observable within the background for at least three consecutive image frames.</u>

As described with regard to claim 1, Kreitman et al. do not derive a background model from a plurality of image frames. Gardos et al.'s reference frame does not include criteria for determining whether a pixel is part of the reference frame. Applicants' claim 8 recites that a background pixel is included in the background model only after being observed in the background for at least 3 consecutive image frames.

Claims 9-14 ultimately depend from claim 8, and distinguish over the cited art for the same reasons as given for claim 8. Claims 13 and 14 further distinguish over the cited art as indicated by the examiner. Claim 11 further distinguishes over the cited art based on the processor predicting a background value based in part on a mixing factor. This distinction is discussed in more detail below with regard to new claims 15 and 25.

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New Claims 15-18 and 25

New claim 15 is an independent method claim having limitations similar to original claims 1 and 4. Claim 15 distinguishes over the cited art based at least upon the following claim limitations:

- maintaining a background model of background pixels which have been observable in at least three consecutive image frames by predicting, for each one pixel of a current image frame, a background value for said one pixel based upon a predicted background value of said one pixel from the prior image frame, a pixel value of said one pixel from the current image frame, and <u>a mixing factor for weighting the background value of said one pixel from the prior image frame</u>.

The cited art does not disclose or suggest a mixing factor used in predicting a background value for a pixel in a current image frame. Specifically the cited art does not disclose or suggest a mixing factor for weighting the contribution for the prediction of a background value of a corresponding pixel from a prior image frame.

Claims 16-18 depend from claim 15 and add limitations similar to those of original claims 2, 3 and 5. Claims 16-18 distinguish over the cited art for the same reasons as given for claim 15.

New claim 25 is an apparatus claim having limitations similar to original claims 8 and 11. Claim 25 distinguishes over the cited art based at least upon the following claim limitations:

- a first processor which predicts a background value for said each one pixel based upon a predicted background value of said each one pixel from the prior image frame, a pixel value of said each one pixel from the current image frame, and <u>a mixing factor for weighting the background value of said one pixel from the prior image frame.</u>

New Claims 19-21 and 26

New claim 19 corresponds to original claim 6 rewritten in independent format. New

claims 20-21 depend from claim 19, and add limitations similar to those of original claims 2 and 3. New claim 26 corresponds to original claim 13 rewritten in independent format.

New Claims 22-24 and 27

New claim 22 corresponds to original claim 7 rewritten in independent format. New claims 23-24 depend from claim 22, and add limitations similar to those of original claims 2 and 3. New claim 27 corresponds to original claim 14 rewritten in independent format.

Conclusion

In view of the above remarks regarding the cited art, it is respectfully submitted that the claims contain key limitations that are not present in the cited art and not obvious from the cited art. These particular limitations are not disclosed in or suggested by cited references. These limitations are significant advances over the prior art and resulted in a novel method and apparatus for tracking an object among a plurality of image frames.

In view of the above amendments and remarks, it is respectfully submitted that the claims are now in condition for allowance. The Examiner's action to that end is respectfully requested. Reconsideration of the claims and withdrawal of the rejections is respectfully requested.

If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the application, the Examiner is invited to call the undersigned attorney at the telephone number given below.

Respectfully submitted,

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